PSM PRESENTATION

Engineering Process and Tools Organization (EP&TO)

Cost-Effective Process Modeling & Simulation Using the Balanced Scorecard & Raytheon Six Sigma Methodology

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COST EFFECTIVE PROCESS MODELING & SIMULATION USING THE BALANCED SCORECARD & RAYTHEON SIX SIGMA METHODOLOGY

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## BALANCED SCORECARD

### Financial

**Strategic Objective**
- Growth Orientation & Financial Strength

**Measurement**
- Negotiation metric
  - Cash
  - Revenue - 2004 Margin
  - Annual growth ROIC

### Customer

**Strategic Objective**
- Meet Commitments, Expectations Easy to do Business with
- Protect, Expand, Diversify Customer Base

**Measurement**
- Gate 5 reviews
  - Composite award fee SPI CPI
- # of New Acquisition Sources Market Share

### Process

**Strategic Objective**
- Process Improvement
  - Integrated Planning & Forecasting
  - FEOTB - Market, Capture, Propose

**Measurement**
- Defect Rate
  - ROI on Improvements Productivity Improvement (O/H)
- % Functional Groups in Plans
  - Performance to Plan
  - Funnel of Opportunities
  - Balance of Business Portfolio Capture Rate ROI
- Product Development Cycle Time
  - % License & Maintenance Fees / Sales

### Learning

**Strategic Objective**
- Share Best Practices and Lessons Learned
- Focused People Strategy

**Measurement**
- Build / Reuse Ratio
  - Gate II Completion
- Strategic Job Coverage Ratio
  - # Successors / Critical Positions Retention Rate
- Critical Skill / Need Ratio
  - Skill Training Plan Performance to Plan

**Strategic Objective**
- Investment - People, Assets, Technology

**Measurement**
- Targeted R&D to Sales
  - Actual R&D to Sales ROIC
SOFTWARE PROCESS MODEL

S/W CONCEPTS & REQUIREMENTS

SOFTWARE DESIGN

TOTAL SOFTWARE SYSTEM

SOFTWARE CODE TEST INTEGRATION

SOFTWARE MAINTENANCE

CUM. S/W $

TOT. S/W $

% Dev. Var. Fac.

Dev. $

Mean Dev. $  

$  

Time

% Maint. Var. Fac.

Maint. $

Mean Maint. $  

$  

Time

SYSTEMS MODEL

EXECUTION MODEL
BALANCED SCORECARD
TOP LEVEL MODEL
BALANCED SCORECARD ANALYSIS MODEL
BALANCED SCORECARD ANALYSIS MODEL

Financial Perspective

Financial Table

FINANCIAL GRAPH #2

- net profit $K
- delivering services
- revenues $K
- Retained Earnings $K
- expenses $K
- price
- earnings before tax
- tax expense
- tax rate
- Service Deliverers
- pre tax expenses
- salary $K
- overhead percentage
BALANCED SCORECARD ANALYSIS MODEL.

Customer Perspective

Potential Customers
- acquiring by word of mouth
- impact of market saturation
- word of mouth multiplier
- acquiring through sales and marketing
- customers gained per $K spent

Customers
- losing customers
- monthly loss fraction
- service lead time

Cumulative Sales and Marketing Spending $K
- sales and marketing spending $K

Cust Table
Cust Graph
BALANCED SCORECARD SIMULATION OUTPUT
CUSTOMERS (POTENTIAL & "DERIVED")

POTENTIAL CUSTOMERS (LEFT SCALE)
POTENTIAL CUST.: 940.4 - 149.037x + 5.534x^2 - 0.025x^4 + 4.726e-4x^5 + eps

ACQUIRED (WORD) = -4.855 + 22.707x - 4.904x^2 + 0.406x^3 - 0.015x^4 + 2.043e-4x^5 + eps

CUSTOMERS = 75.489 + 153.334x - 23.13x^2 + 1.626x^3 - 0.054x^4 + 6.949e-4x^5 + eps

LOSING CUST. = -52.919 + 60.37x - 10.441x^2 + 0.729x^3 - 0.023x^4 + 2.688e-4x^5 + eps

POTENTIAL CUSTOMERS (LEFT SCALE)
LOSING CUSTOMERS (RIGHT SCALE)
CUSTOMERS (LEFT SCALE)
ACQUIRED & LOSING CUSTOMERS

ACQUIRED CUSTOMERS (RIGHT SCALE)
## BALANCED SCORECARD
### “OPM” OUTPUT

### Engineering Center Summary

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### Performance

- **Stretch Goal**: 10
- **Goal**: 8
- **Baseline**: 6

### Weighting

- **9%**: 0.45
- **9%**: 0.64
- **9%**: 0.82
- **9%**: 0.91
- **9%**: 0.64
- **9%**: 0.64
- **0%**: 0.18
- **0%**: 0.36
- **9%**: 0.27
- **9%**: 0.55
- **0%**: 0
- **0%**: 0

### Score

- **6.1**

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**Note**: The table above represents the performance metrics and scores for an engineering center, with a focus on output management (OPM). The scoring system includes multiple categories such as staffing, direct labor, engineering OH, training, IPDS deployment, gating execution status, measurement maturity, process capability maturity, communications, diversity, Six Sigma, OPM, engineering productivity, and partnership with internal customers. The performance level is calculated based on the weighted scores for each category, resulting in a total score of 6.1.
z=3.406+0.4*x-0.787*y-4.322e-4*x*x-0.004*x*y+0.051*y*y
BALANCED SCORECARD SIMULATION ANALYSIS

Dr. Aaron N. Silver--Balanced Scorecard--Data(Custab01.Sta)

Quadratic Prediction Model--File#:Bal4D1A.Stg--December 13, 2002

Potential Cust.: <= 90
\[ z = 9.078 - 0.5x + 3.95y + 0.026x^2 - 0.401xy + 1.878y^2 \]

Potential Cust.: > 90
\[ z = 0.171 + 0.441x - 0.869y - 4.722\times 10^{-4}x^2 - 0.004xy + 0.051y^2 \]

Diagram showing potential customers: left side for <= 90, right side for > 90.